MUR-V08467

(12) UK Patent Application (19) GB (11) 2 310 221 (13) A

(43) Date of A Publication 20.08.1997

(21) Application No 9702069.7

(22) Date of Filing 31.01.1997

(30) Priority Data

(31)	(32)	(33)
29896	19.02.1996	AT
45296	11.03.1996	
57496	29.03.1996	
105896	17.06.1996	
105996	17.06.1996	
132296	23.07.1996	

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(51) INT CL^6
D04H 18/00

(52) UK CL (Edition O)
D1R RGFD RGFF

(56) Documents Cited
GB 1110246 A GB 0935480 A US 5018255 A
US 3894320 A

(58) Field of Search
UK CL (Edition O) D1R RGFC RGFD RGFF RGFX RGFZ
INT CL^6 D04H 18/00
Online: WPI

(54) A method and device for needling a web

(57) A web 3 is continuously withdrawn by withdrawal rollers 7. To increase the average withdrawal speed a needled web section is accelerated to a speed exceeding the withdrawal speed to create a surplus length of web that passes through the rollers whilst the web section currently being needled remains stationary. The web may be accelerated by a stream of air from nozzle 9 or by a roller admitting slip with respect to the web. The web may be supplied at a constant speed by rollers 13. An additional surplus web store 30 may be created on the inlet side of the needles by either a stream of air from nozzle 28, or by a continuously rotating roller with radial projections. The inlet side of the needle board may be provided with longer thicker needles to retard the motion of the web before the other needles penetrate. The conveying speed of the rollers may be automatically controlled by sensing the surplus length of web stored.

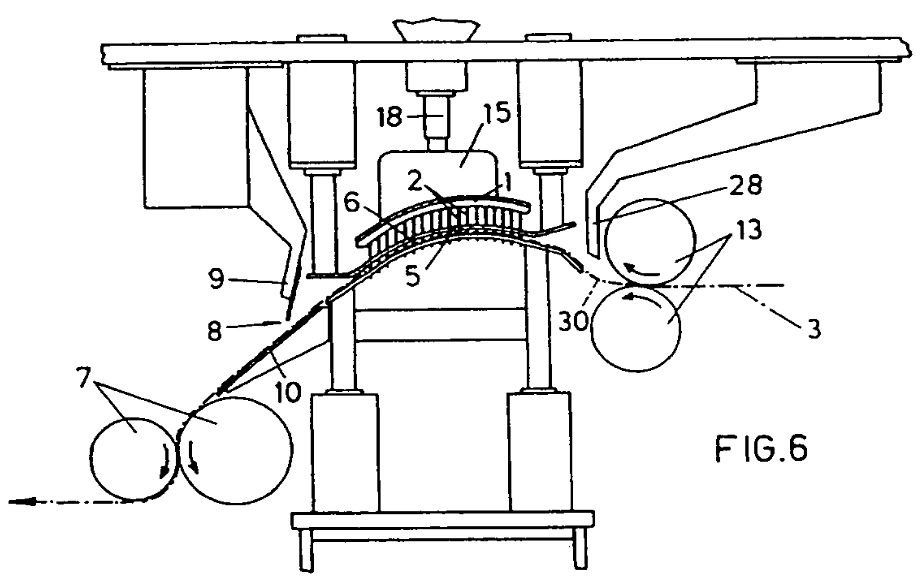

FIG.6

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FIG.1

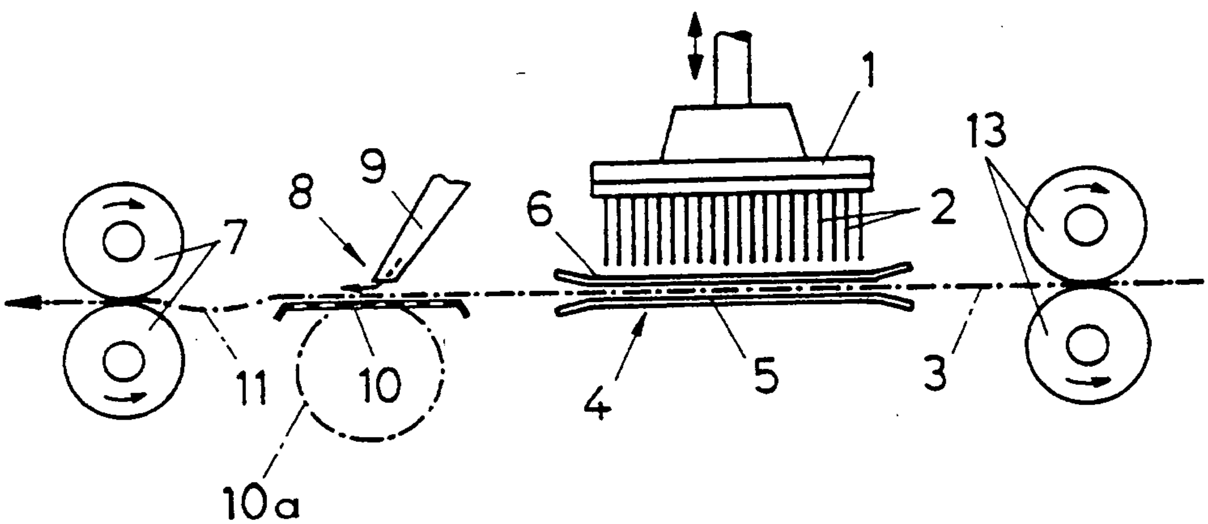

FIG.2

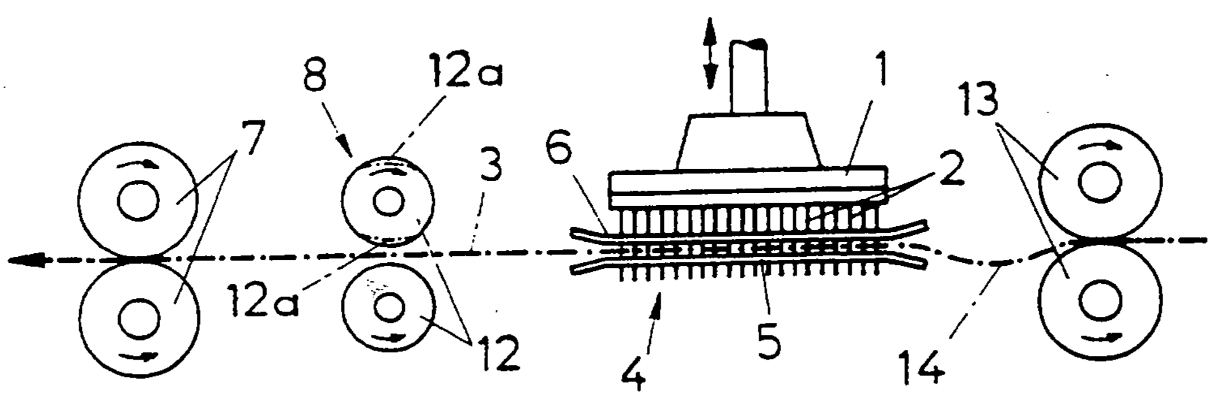

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FIG.3

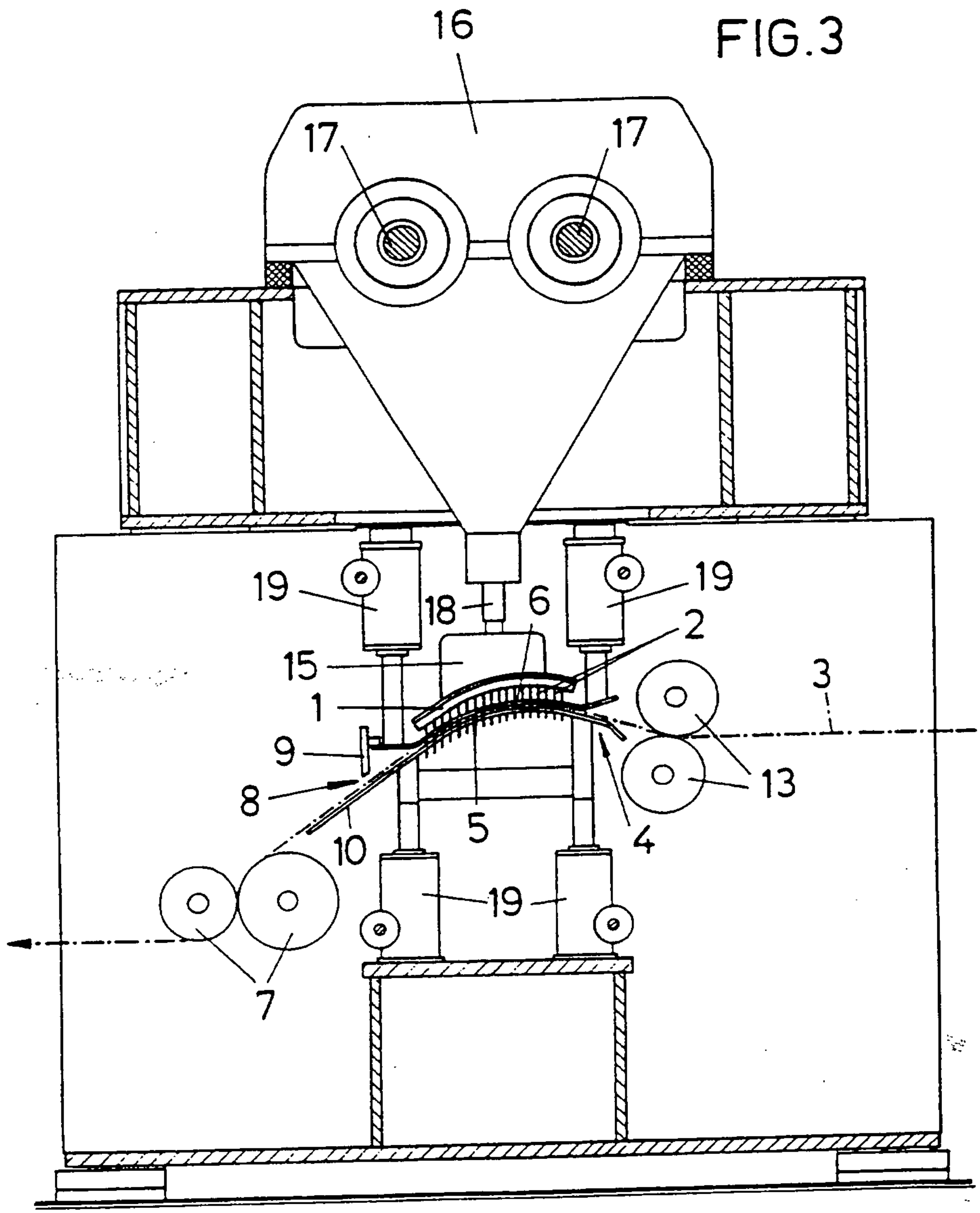
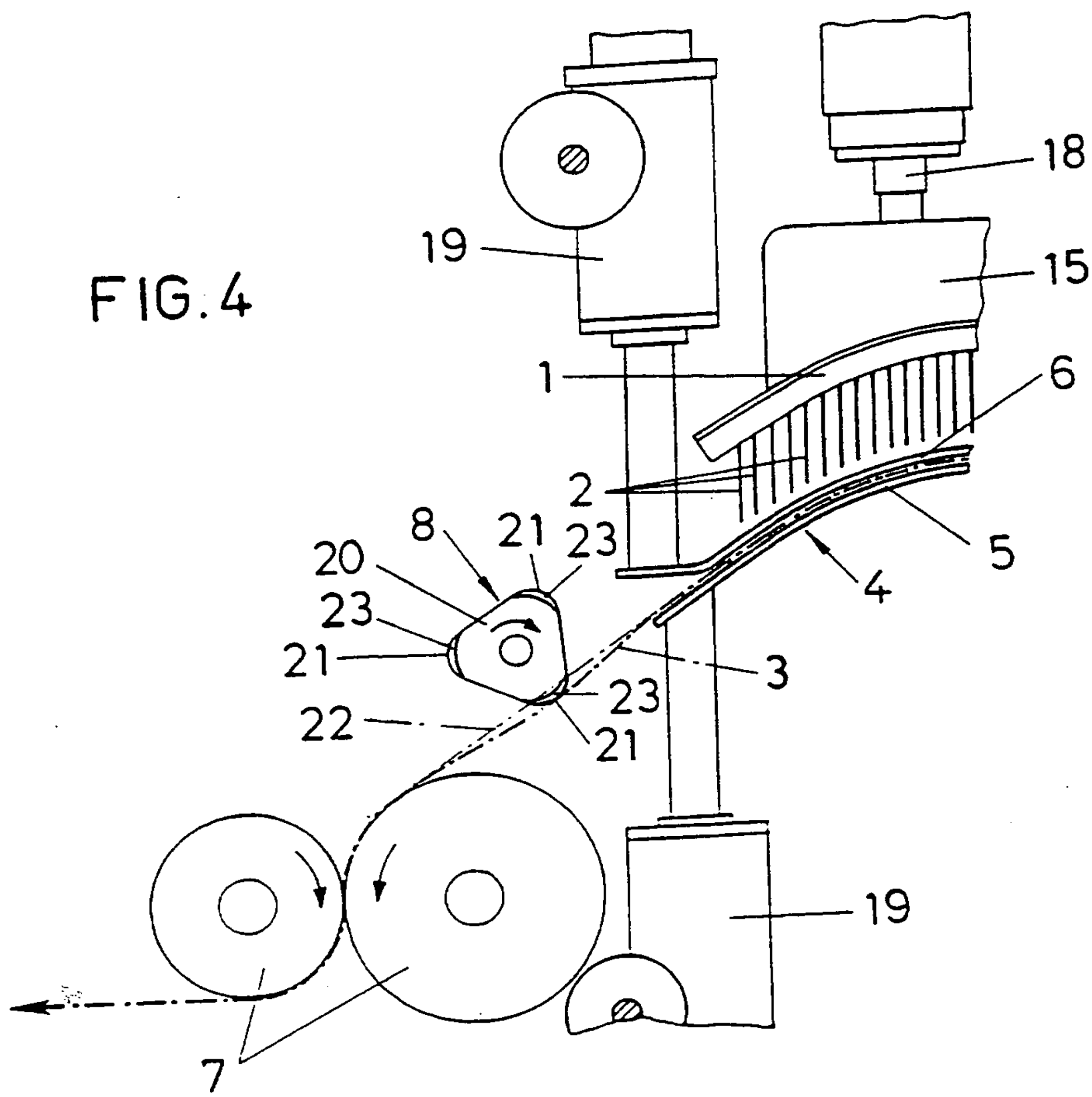


FIG. 4



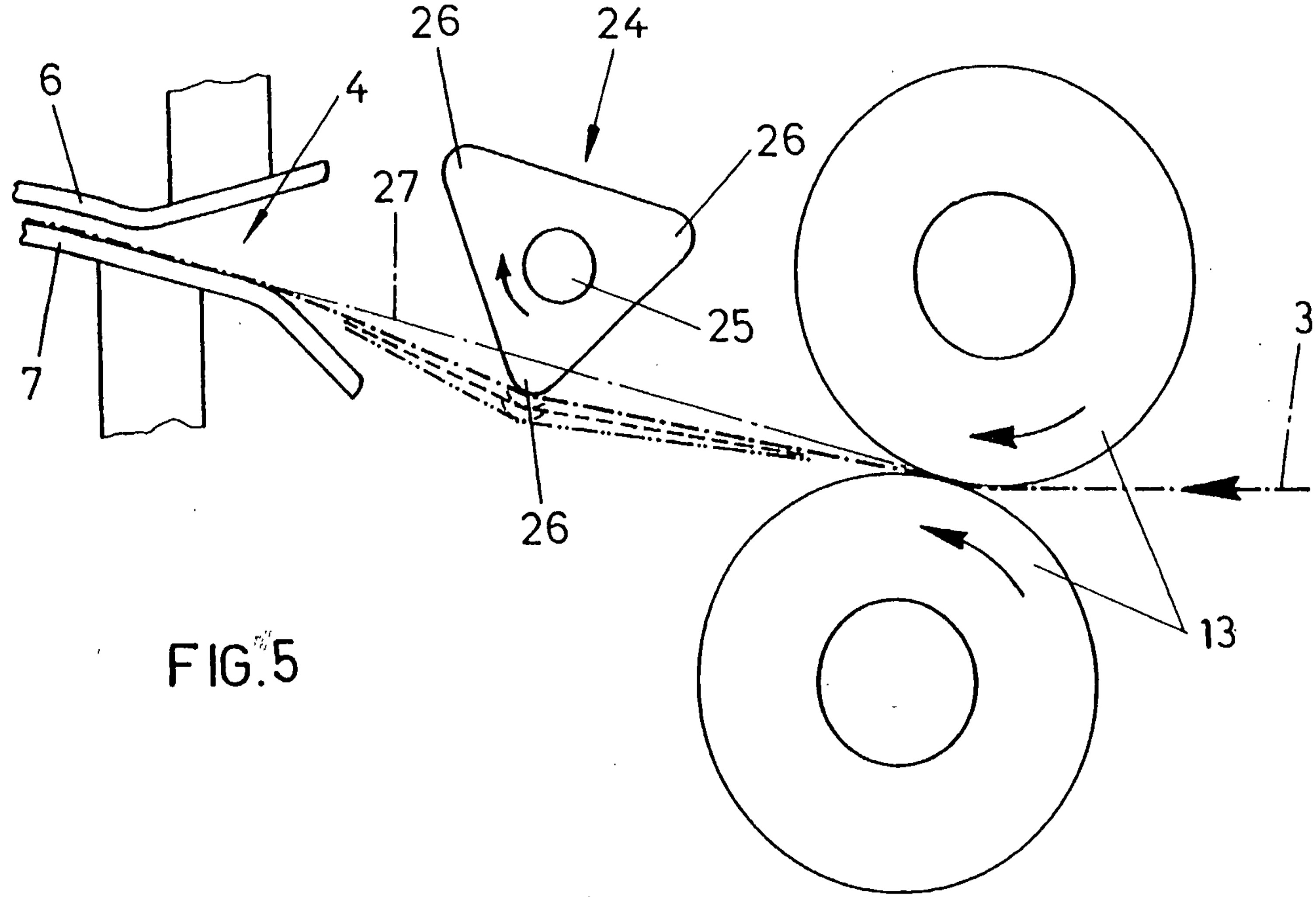


FIG.5

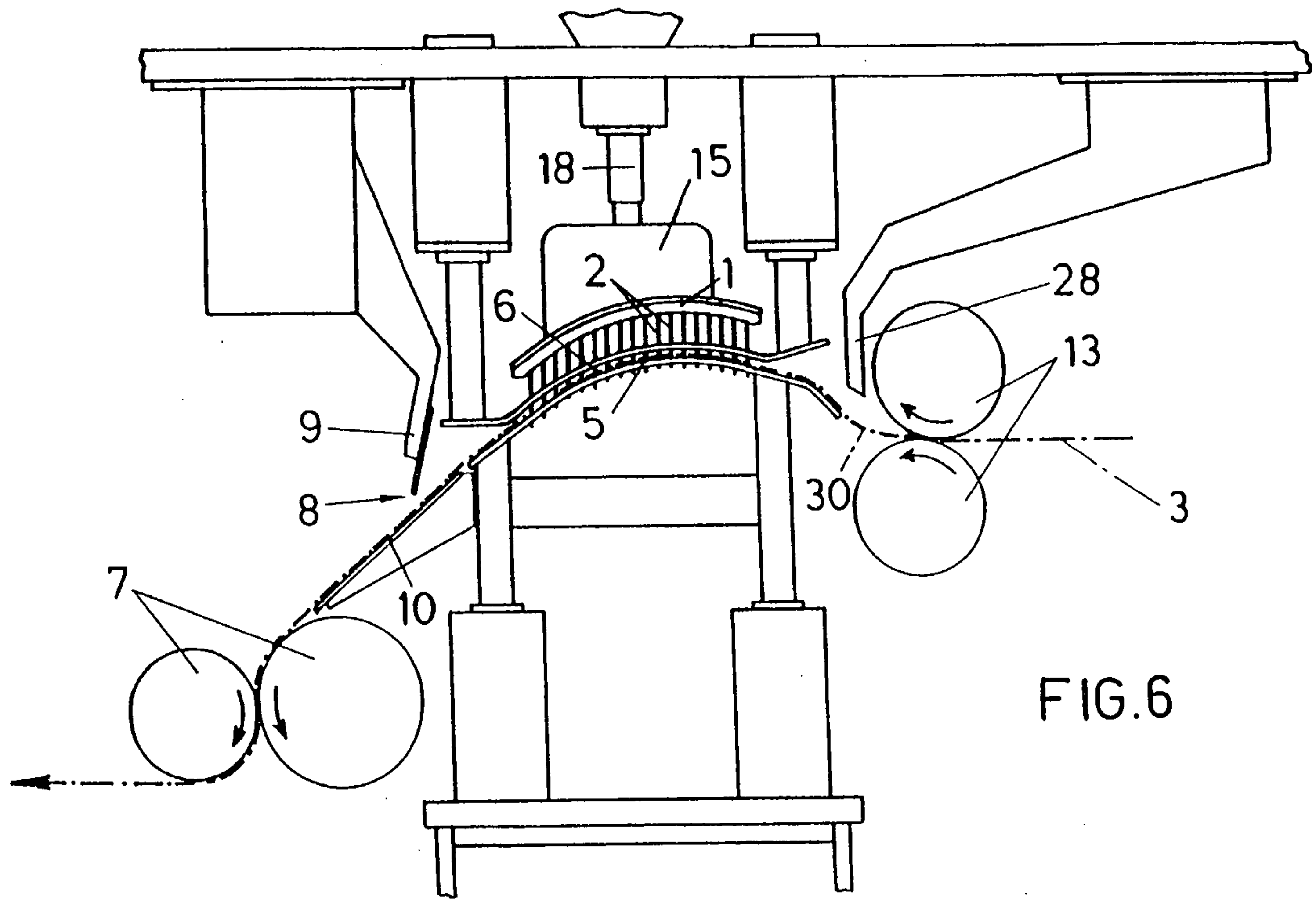


FIG.6

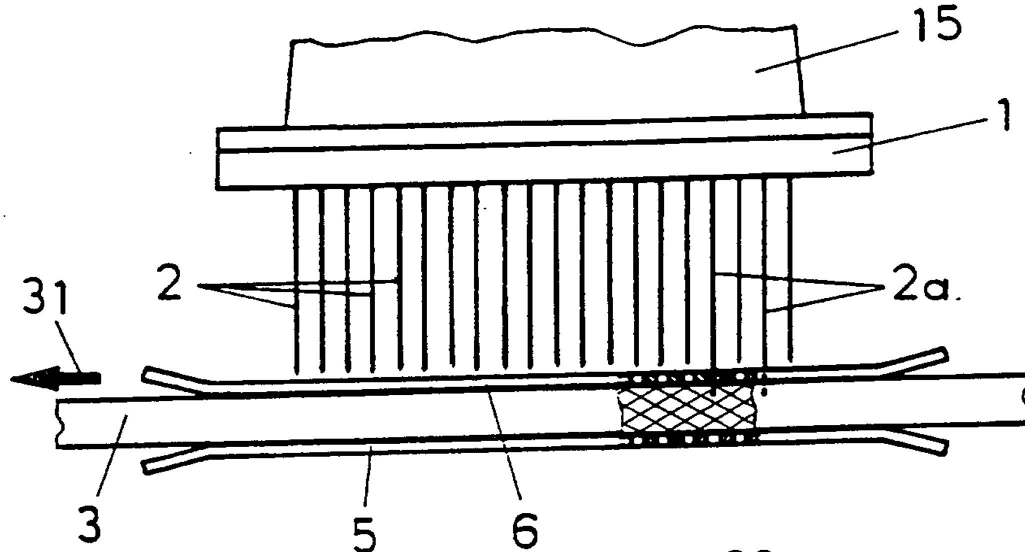


FIG.7

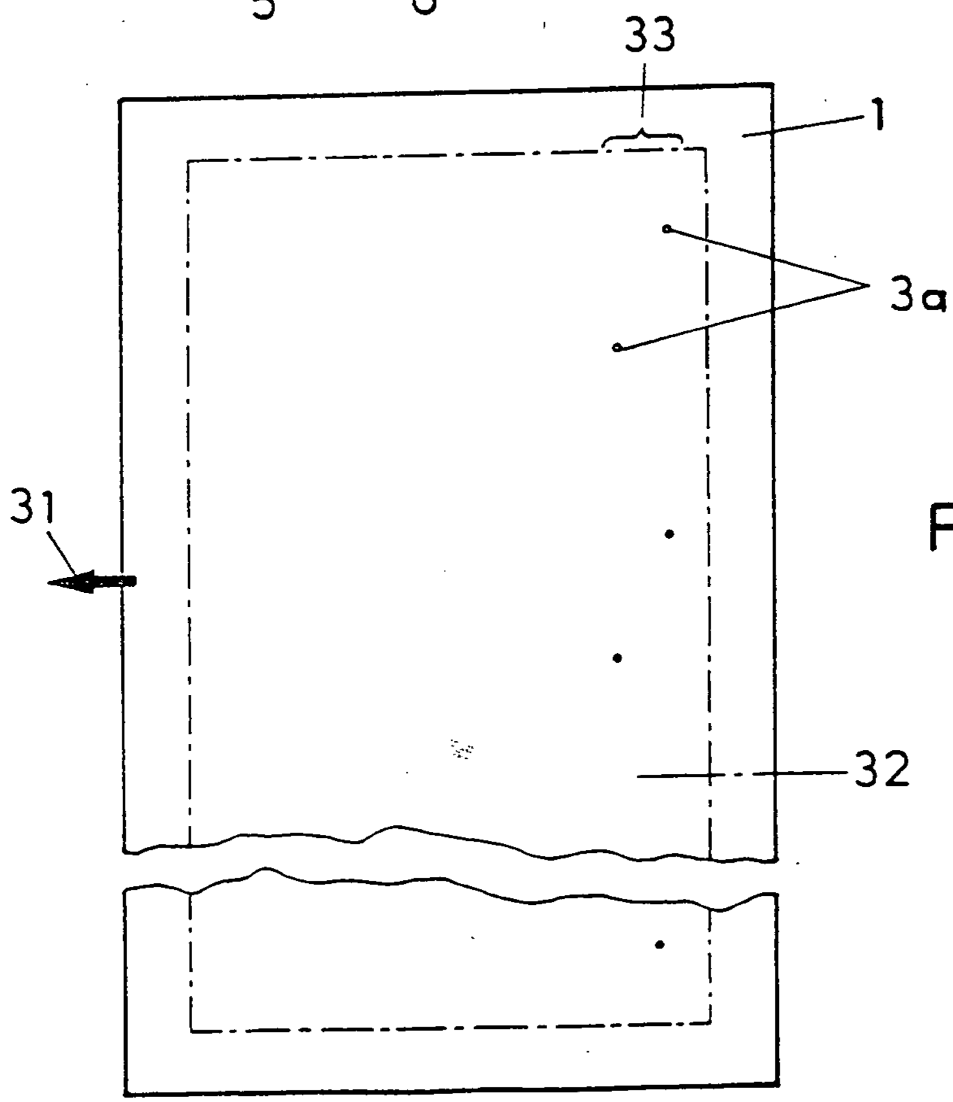


FIG.8

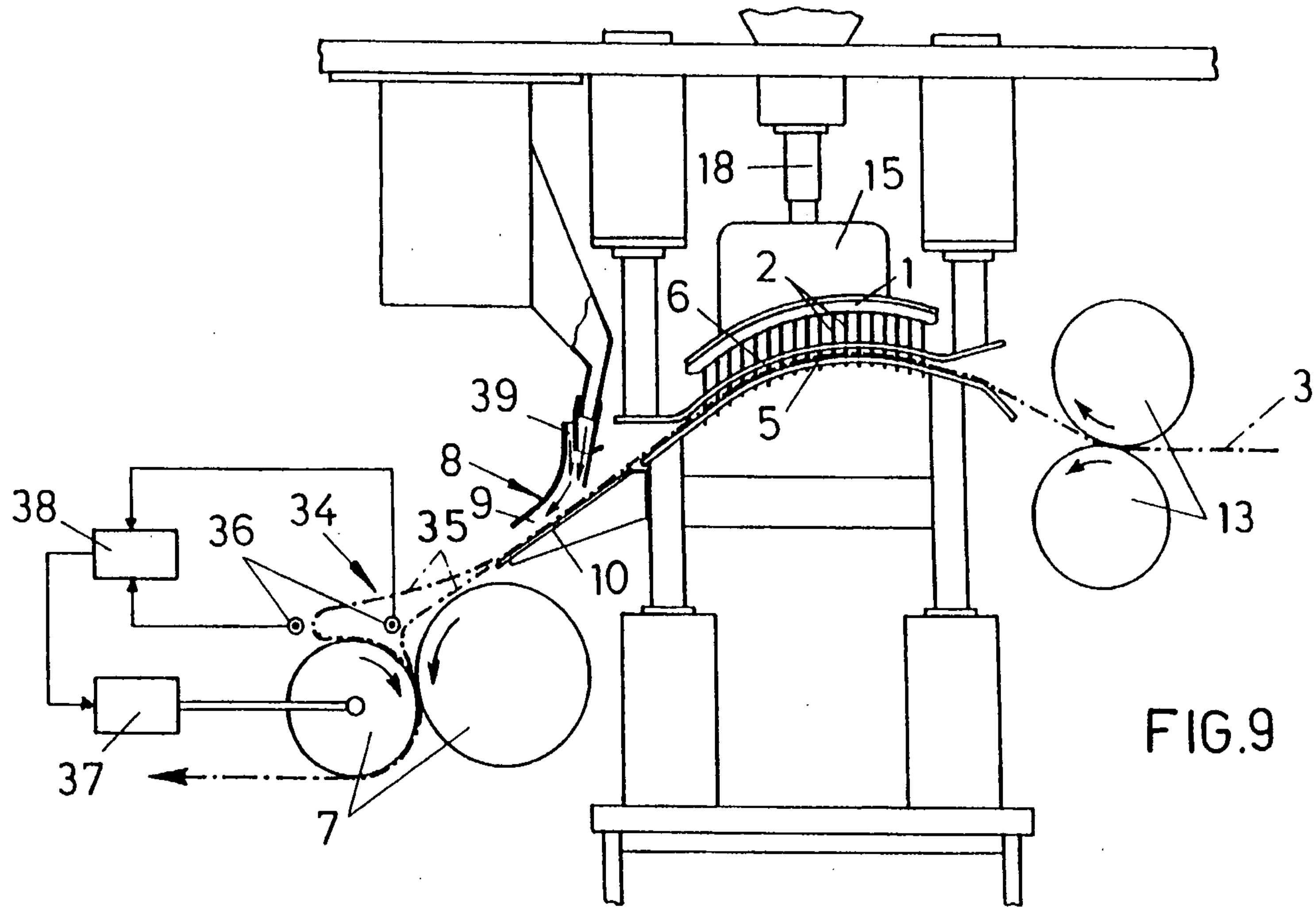


FIG.9

Method and Device for Needling a Web

This invention relates to a method of needling a web by means of needles repeatedly stitching into the web, where the web is withdrawn from the needling area at a continuous withdrawal speed by stretching the same during the impingement of the needles and by accelerating the same during the release by the needles, and to a device for carrying out this method.

When a web is continuously withdrawn from a needling device, the web is held back from the continuous withdrawal during the impingement of the needles with the effect that the web is stretched in withdrawal direction. When the needles move out of the web, the same is accelerated to the withdrawal speed as a result of the continuous withdrawal and moved on with respect to the needles, until the web is again retarded as a result of the renewed impingement of needles. The continuous withdrawal speed therefore depends on the admissible degree of stretching the web, the stitching frequency of the needles and the needle stroke, and thus on the period of the release of the web by the needles. However, these parameters also limit the possible withdrawal speed. To achieve an increase of the continuous withdrawal speed despite such limitation it is known to additionally reciprocate the needle board in direction of web movement, so that during the impingement the needles have a component of movement in withdrawal direction, which provides for a restricted increase of the withdrawal speed, but involves a comparatively large effort.

It is therefore the object underlying the invention to develop a method of needling a web as described above such that an increase of the continuous withdrawal speed can be effected with little effort.

This object is solved by the invention in that after having been needled, but before being withdrawn continuously, the web is accelerated to a speed exceeding the withdrawal speed during the release by the needles.

As a result of the additional acceleration of the web during its release by the needles, the web can be drawn past the disengaged needles at a speed considerably exceeding the withdrawal speed, so that in the area of the needles a correspondingly increased mean speed of movement of the web is achieved. This is possible despite the restriction to a predetermined degree of stretching, because the acceleration of the web preceding the subsequent continuous withdrawal results in a strain relief with an excess length conveyed, which during the impingement of the needles and the resulting retardation of the web must first be discharged via the continuous withdrawal, before tensile forces can act on the web for stretching the same.

Particularly advantageous conditions are obtained for the additional acceleration of the web, when the web is accelerated to a speed exceeding the withdrawal speed by means of a continuous stream of conveying air having a flow component in withdrawal direction. This continuous stream of conveying air ensures a fast entrainment of the web, as soon as the same is released by the needles, where high conveying speeds can easily be achieved as a result of the possible high flow rates.

In this connection it is advantageous when the web moved out of the needle area merely by means of the stream of conveying air is guided free from tensile stress in a longitudinal sec-

tion prior to its withdrawal, because in this case the web is stressed in the needle area merely by the stream of conveying air, which in dependence on the flow conditions leads to comparatively little tensile stress of the web during the impingement of the needles, so that a needling is possible, which can be effected without stretching the needled web. The stepwise conveyance of the web during the release by the needles is easily ensured by the stream of conveying air, when the web is continuously supplied to the needle area, and thus during the release of the web by the needles the stock length piled up before the needle area during the impingement of the needles can be withdrawn from the needle area by the stream of conveying air continuously acting on the web. Thus, the supply speed determines the mean speed of movement of the web through the needle area.

To avoid stitch agglomerations in the web which lead to surface patterns, the web supplied at a predetermined supply speed can be deflected on the inlet side of the needles transverse to the web to different extents during the release by the needles, and on the outlet side of the needles can be pulled until it is stretched. As a result of the predetermined continuous speed at which the web is supplied to the needles, the web will pile up during the impingement of the needles impeding the conveyance of the web, for instance in the form of a free sag before the needle area, so that during the release of the web by the needles, the piled up stock length of the web will be used up again by pulling the web on the outlet side. When during the withdrawal movement the web is now deflected in transverse direction on the inlet side, the possible pulling length to the stretched position will be shortened. By means of different deflection widths different conveying steps can therefore easily be ensured for the web during its release by the needles with the effect that the formation of a pattern on the surface of the web as a result

of irregular stitch densities of the needles can largely be avoided, namely within a wide range of the mean feed rates.

For carrying out this method a usual needling device can be used, which comprises at least one needle board reciprocatingly movable in stitching direction, a stitch base opposite the needle board, and continuously driven delivery rollers for the needled web provided at a distance subsequent to the stitch base. Between the stitch base and the delivery rollers there need merely be provided a web conveyor operating at a conveying speed that is larger than the withdrawal speed of the delivery rollers. A continuous conveying speed of the additional web conveyor ensures a simple drive, but requires a corresponding slip between the web conveyor and the web during the impingement of the needles. This slip must, however, provide for a corresponding entrainment of the web after the web has been released by the needles.

To minimize the web mass to be accelerated, a drivable pair of inlet rollers may be provided before the stitch base, whose conveying speed is selected such that the feed length, by which the web is moved on after its release by the needles, is available during the impingement of the needles directly before the stitch base. By means of the web conveyor disposed subsequent to the stitch base, substantially merely the web section disposed adjacent the stitch base must be accelerated accordingly.

As mentioned above, a stream of blow air can be used to particular advantage for the additional acceleration of the web. For this purpose, the web conveyor can comprise at least one blow nozzle inclined at an acute angle with respect to the web for a flow component extending in withdrawal direction. Instead of a blow nozzle substantially extending over the width of the web, a plurality of blow nozzles distributed over the width of the web may also be used. For taking into

account special conveying conditions, the blow nozzles may be arranged one behind the other in withdrawal direction. The blow air can at least partially be discharged via an air-permeable surface for guiding the web provided on the side of the web opposite the blow nozzle. When the guiding surface is formed by the shell of a drum rotating in withdrawal direction, this rotating drum will promote the acceleration of the web.

A further possibility for accelerating the web between the stitch base and the delivery rollers to a speed exceeding the withdrawal speed consists in the fact that the web conveyor consists of at least one pair of rollers receiving the web with a slip in its gap, which pair of rollers can be driven at a peripheral speed exceeding the withdrawal speed of the delivery rollers. Since the rollers are driven continuously, there are also created advantageous drive conditions for this web conveyor. To improve the entrainment of the web during its release by the needles, at least one of the rollers of the web conveyor may have flattened portions determining the slip during the impingement of the needles, so that for the entrainment of the web a frictional engagement between the rollers and the web can be ensured that is considerably increased with respect to the range of slip. In this connection it is of course necessary that the rotational speed of the rollers be selected in consideration of the number of flattened portions distributed over the periphery in dependence on the lifting frequency of the needle board.

To achieve periodically changing conveying steps for the web between the needle stitches, a web conveyor may advantageously be provided between the stitch base and the delivery roller which periodically acts on the web in dependence on the lifting frequency of the needle board. With this action of the web conveyor on the web a larger conveying step is achieved. In dependence on the lifting frequency of the nee-

dle board, the web can thus be conveyed with a larger conveying step with respect to the needles at least after a certain number of needle strokes, so as to avoid the formation of surface patterns as a result of corresponding stitch agglomerations. The continuous withdrawal speed of the delivery rollers thus determines the mean feed. When between two needle strokes the web is conveyed with a larger conveying step towards the delivery rollers as a result of the additional feeding means, the excess length of the web conveyed by the additional feeding means must first be discharged by the delivery rollers in the subsequent conveying step, before the delivery rollers can pull the web for a further, correspondingly reduced conveying step.

Due to the comparatively high lifting frequencies a jerky additional conveyance of the web should be provided. This can advantageously be ensured in that the web conveyor consists of a continuously rotating roller parallel to the delivery rollers, which has radial pick-ups for deflecting the web transverse to the web surface. The increase of the web length between the stitch base and the delivery rollers as a result of the deflection of the web transverse to the web surface determines the larger conveying step during the release of the web by the needles, where the continuously rotating roller of the web conveyor, which is provided with corresponding pick-ups, provides for very simple drive conditions. When the radial distance of the pick-ups from the rotational axis of the roller is selected differently, the increase of the conveying step is varied by the web conveyor. For increasing the entrainment of the web in conveying direction by the pick-ups, the same can be provided with a friction lining increasing the frictional engagement with respect to the web.

A non-uniform advancement of the web for producing a pattern-free surface can also be achieved in that between the stitch base and the pair of inlet rollers an additional deflection

means is provided which in dependence on the lifting frequency of the needle board periodically acts on the web. On the outlet side of the stitch base there should, however, be provided a web conveyor admitting a slip with respect to the web. The possible slip between this web conveyor and the web is necessary to account for the different conveying steps resulting from the different deflection widths of the web on the inlet side, when inadmissible tensile stresses acting on the web should be avoided in particular at higher mean feed rates. The deflection means can consist of a rotating roller parallel to the pair of inlet rollers, which has radial deflection lugs for the web, so that the respective deflection of the web is determined by the deflection lugs, which depending on the rotary position of the roller protrude towards the web or release the same. Due to the continuous rotation of the rollers, very simple constructional conditions are obtained for the roller drive, all the more so as the rotational speed can easily be controlled in dependence on the lifting frequency of the needles. When the radial distance of the pick-ups from the rotational axis of the roller is selected differently, the change of the conveying step by the deflection means is varied.

To ensure a high acceleration of the web during the release of the web by the needles, at least one further blow nozzle aligned transverse to the web may be disposed between the inlet rollers and the stitch base adjacent a free web guide on the side of the web opposite the stitch base, which blow nozzles promote the storage of the web length supplied to the needle board during the impingement of the needles and the interrupted web conveyance in the area of the free web guide in the form of a sag. This web length is then withdrawn from this reservoir with little effort after the web has been released by the needles. The blow nozzle aligned transverse to the web ensures an undisturbed formation of a web sag to the respective extent of the supplied web length. Since the blow

nozzle is arranged on the side of the web opposite the stitch base, a lifting of the web from the stitch base is in addition efficiently prevented.

In particular at higher speeds of movement there is a risk that at the beginning of the stitching process the web is scratched by the sharp needle tips adjacent the web surface in direction of web movement as a result of the component of web movement transverse to the needles. To largely eliminate this risk of scratching, at least one portion of the needle board extending transverse to the direction of web movement may have individual needles protruding beyond the other needles in stitching direction. The needles protruding beyond the other needles naturally penetrate into the web before the other needles, so that these protruding needles largely retard the web, before the other needles can penetrate into the web surface. In this way, the risk of scratching the web surface is restricted to the area of the few protruding needles, which in practice leads to a suppression of the noticeable impairment of the needled web as a result of the scratching by the needle tips. The number of the protruding needles should be selected such in consideration of the needle load, that with the selected number of needles a sufficient retarding effect can be exerted on the web, without having to accept an inadmissible needle load. To account for the higher needle load, the protruding needles may be provided with a thicker stem than the other needles.

To prevent the needles protruding beyond the other needles from disturbing the uniform appearance of the surface of the needled web as a result of their singular position, it is recommended to provide the protruding needles in an inlet side portion of the needle board, so that the singular points at best caused by the protruding needles can be covered by the subsequent needle stitches.

When the conveying speed of the delivery rollers is controlled by a stock length of the web stored between the blow nozzle and the delivery rollers, there can easily be achieved a needling free from tensile stress, because a tensile stress of the web acting on the needle area is avoided. When the stock length stored before the delivery rollers exceeds a predetermined upper limit, part of the stock length is discharged by means of an increase of the withdrawal speed of the delivery rollers. When the stock length falls below a predetermined lower limit, the withdrawal speed is reduced. With such a speed control of the delivery rollers any irregularities influencing the feed of the web in the needle area are automatically considered. For the stored stock length, a separate storage means might be provided. In general, a corresponding stock loop of the web directly before the delivery rollers will be sufficient.

The inventive method of continuously needling a prebonded web will now be explained in detail with reference to the drawing, wherein:

Fig. 1 shows an inventive device for carrying out the method in a schematic side view,

Fig. 2 shows a representation of an embodiment of the inventive device in accordance with Fig. 1,

Fig. 3 shows an inventive device for needling a prebonded web in a simplified longitudinal section,

Fig. 4 shows segments of a further embodiment of an inventive device on an enlarged scale as compared to Fig. 3,

Fig. 5 shows segments of a device additionally provided with a deflection means on the inlet side, as compared to the device in accordance with Fig. 3, on an enlarged scale in the area of this deflection means,

Fig. 6 shows a further embodiment of an inventive device in a simplified side view,

Fig. 7 shows segments of an inventive device with needles of different lengths in a schematic side view, partly in an elevation, on an enlarged scale,

Fig. 8 shows the needle board of the device in accordance with Fig. 7 in a view from the needle side, and

Fig. 9 shows a further embodiment of an inventive device in a simplified side view.

The device in accordance with Fig. 1 has a needle board 1 with needles 2 stitching into a prebonded, preferably preneedled web 3, namely adjacent a web guide 4, which consists of a stitch base 5 opposite the needle board 1 and a stripper 6 between the stitch base 5 and the needle board 1. The needled web 3 is conventionally withdrawn by means of continuously driven delivery rollers 7. In contrast to conventional devices of this kind, an additional web conveyor 8 is provided between the web guide 4 and the delivery rollers 7, which web conveyor admits a slip with respect to the web 3 and has a continuous conveying speed larger than the withdrawal speed of the delivery rollers 7. This web conveyor consists of a blow nozzle 9 inclined at an acute angle with respect to the web 3, to which blow nozzle an air-permeable guiding surface 10 is associated on the opposite web side. Instead of an immovable guiding surface 10 there might also be provided a rotating drum 10a, as this is indicated in dash-dotted lines. When the web 3 is released upon retracting the needles 2, the flow component of the blow nozzle 9 extending in withdrawal direction effects a quick acceleration of the web 3 to a speed exceeding the continuous withdrawal speed, which has the effect that the excess length of the web 3 supplied by the web conveyor 8 as a result of the speed difference piles up in a sag 11 before the delivery rollers 7. When the web 3 is retarded during the subsequent impingement of the needles, this excess length is first of all discharged via the delivery rollers 7, and the web 3 is then at best subjected to stretching until the web 3 is again released by the needles.

In Fig. 2 a pair of rollers 12 is provided as web conveyor 8, which is driven continuously at a peripheral speed exceeding the peripheral speed of the delivery rollers 7 and receives the web 3 with a slip in its gap. During the represented impingement of the needles and the associated retainment of the web 3 there is thus produced a corresponding slip between the web 3 and the continuously rotating pair of rollers 12. When the needles 2 release the web, the frictional forces between the pair of rollers 12 and the web 3 are, however, sufficient for a corresponding acceleration of the web 3. To facilitate a stepwise conveyance, at least one of the two rollers 12 may be provided with flattened portions 12a determining the slip, as this is indicated in dash-dotted lines in Fig. 2.

To ensure that only a restricted web section must be accelerated by the additional web conveyor 8, a pair of inlet rollers 13 may be provided before the web guide 4, whose continuous peripheral speed is designed such that by means of the pair of inlet rollers 13 the web 3 is supplied during the impingement of the needles in a length that just corresponds to the advancement of the web 3 between two succeeding needle stitches. This means that during the impingement of the needles a free sag 14 of the web 3 is piled up between the web guide 4 and the pair of inlet rollers 13, as this is indicated in Fig. 2. By accelerating the web during the release of the web by the needles 2, the excess length stored in this sag 14 is used up.

Fig. 3 shows a constructive solution of the device schematically represented in Fig. 1. The needle board 1 held in a needle bar 15 is driven by a thrust crank drive 16, which is formed by two parallel crank or eccentric shafts 17 driven in opposite directions, and by push rods supported thereon, which are connected with each other by a connecting rod, at which the push rods 18 are pivotally mounted for moving the needle board. For adjusting the stitching depth and for

adapting the same to the respective web thickness, both the stitch base 5 and the stripper 6 are vertically adjustable by means of actuators 19.

The stitch base 5 and the stripper 6 have a continuous curvature, which results in differently inclined portions for the web guide 4 in direction of web movement. Since the web 3 lies flat against the stitch base 5, the needles 2 have stitching channels with different inclinations with respect to the web surface in dependence on the respective inclination of the stitch base 5. The average inclination of the stitch base 5 is inclined with respect to the direction of movement of the needle board 1, which results in a corresponding preferred inclination of the needle stitches into the web 3, namely in the sense of stitches with a component in direction of web movement. This predominant stitching direction involves an increase of the longitudinal strength of the web 3.

The stitch base 5 is prolonged on the outlet side to form the guiding surface 10, to which the blow nozzle 9 is associated on the opposite side of the web. This blow nozzle 9 is preferably fixed at the stripper 6, so that a predetermined distance from the web surface is obtained. Since the blow nozzle 9 includes an acute angle with the web 3 due to the descending guiding surface, a conveying force is exerted on the web 3 in withdrawal direction by means of the stream of blow air. When the web 3 is released by the needles 2, this conveying force effects a corresponding acceleration of the web 3 to a speed exceeding the continuous withdrawal speed of the pair of delivery rollers 7, so that the continuous withdrawal speed can be increased considerably. Due to the guiding surface 10 descending in withdrawal direction, the acceleration of the web 3 caused by the stream of blow air is promoted by gravity.

In accordance with Fig. 4, the additional web conveyor 8 consists of a continuously rotating roller 20 with three pick-ups 21 distributed over the periphery, which during a rotation of the roller periodically pick up the web 3 one after the other by deflecting the same transverse to the usual plane of movement 22, as this can be taken from Fig. 4. Since the rotational speed of the roller 20 is selected in dependence on the lifting frequency of the needle board 1 such that the web 3 is deflected while it is released by the needles 2, the web 3 is moved on with respect to the needle board 1 by a distance that is larger than the conveying step exclusively predetermined by the delivery rollers 7, and is determined by the increase of the distance as a result of the deflection and the entrainment in conveying direction. This larger conveying step, however, is followed by a smaller conveying step, because in the subsequent conveying step the excess length conveyed in the preceding conveying step as compared to the mean feed must be discharged by the delivery rollers 7, before the web 3 can be moved on by the web guide 4. To ensure the desired effect, the rotational speed of the roller 20 must be adjusted to the lifting frequency of the needle board 1 such that the pick-ups 21 have a deflecting effect on the web 3 at least after a certain number of needle board strokes. To achieve different lengths of the conveying step caused by the web conveyor 8, the radial distance of the pick-ups 21 from each other can be selected differently, as shown in Fig. 4. The pick-ups 21 can additionally be provided with a lining 23 increasing the frictional engagement with respect to the web 3, so as to ensure a corresponding entrainment of the web in conveying direction.

In accordance with Fig. 5, a deflection means 24 for the web 3 is provided between the pair of inlet rollers 13 and the web guide 4 in the form of a continuously rotating roller 25, which for instance has three deflection lugs 26 radially protruding to different extents. As in the web conveyor 8 shown

in Fig. 4, the web 3 is deflected by the deflection lugs 26 transverse to the usual plane of movement 27 depending on the rotational position of the roller 25. Since the rotational speed of the roller 25 is selected in dependence on the lifting frequency of the needle board 1 such that the web 3 is deflected during a release by the needles 2 at least after a predetermined number of needle strokes, the web 3 must cover a larger distance between the pair of inlet rollers 13 and the web guide 4 depending on the respective deflection width. This increase of the distance with respect to the usual plane of movement 27 produces different conveying steps for the web 3 in dependence on the respective deflection width, when it is ensured that the web 3 is pulled on until it is stretched during its release by the needles 2. In this connection it should be considered that during the impingement of the needles and the resulting holding of the web 3 against a displacement in the web guide 4, the web will pile up in the form of a free sag between the pair of inlet rollers 13 and the web guide 4, which sag must be pulled on the outlet side during the release of the web by the needles 2. Since the length of the individual conveying steps is also determined by the deflection widths, the length of the conveying step can be varied by a different radial distance of the deflection lugs 26 from the rotational axis of the roller 25, as this is indicated in dash-dotted lines in Fig. 5.

Between the inlet rollers 13 and the stitch base 5 a further blow nozzle 28 is provided on the side of the web 3 facing away from the stitch base 5, as this is shown in Fig. 6, where the stream of blow air extends transverse to the web 3. Since the web 3 is held against a conveyance during the impingement of the needles 2 of the needle board 1, the web length conveyed during the impingement of the needles by the inlet rollers 8 is deflected adjacent the free web guide 29 between the stitch base 5 and the inlet rollers 13 by the stream of blow air of the blow nozzle 28 to form a sag 30.

This sag 30 constitutes a web store, which during the release of the web 3 by the needles 2 is emptied again due to the additional acceleration of the web by the stream of blow air of the blow nozzle 9. When during the subsequent impingement of the needles the web 5 is retarded, the excess length piled up before the delivery rollers 7 is first of all discharged by the delivery rollers 7, before a tensile stress can be applied on the web 3, which leads to a stretching of the web 3. This stretching can be adjusted by means of the difference of the continuous input and withdrawal speeds.

Since the conveying speed of the web 3 that can be achieved between the individual needle impingements is largest at the beginning of the needle impingement, there is a risk that the sharp needle tips, which penetrate into the web surface moving transverse to the needles 2, may hurt the web surface. To eliminate this risk of scratching, which increases with increasing speed of movement of the web 3, the needle board 1 in accordance with Fig. 7 and 8 is equipped with individual needles 2a protruding beyond the other needles 2 in stitching direction in the area of at least one portion extending transverse to the direction of web movement 31, as is particularly indicated in Fig. 7. In accordance with Fig. 8, these needles 2a are distributed in the needle area 32 equipped with the needles 2, which is indicated in dash-dotted lines, over an inlet side portion 33 of the needle board 1 and due to their larger length stitch into the web 3 prior to the other needles 2. Fig. 7 illustrates this position of the needle board, in which the web 3 is retarded by the protruding needles 2a, before the other needles 2 reach the web surface. This means that a risk of scratching can only occur locally in the area of the needles 2a, which due to the few needles 2a distributed over the working width and required for the retardation of the web cannot lead to an inadmissible impairment of the needled web 3. In this connection it should be considered that the mutual axial distance

of the protruding needles 2a is larger than the mutual axial distance of the remaining needles 2 by a multiple, for instance by more than the decuple. In practice, an axial distance of the longer needles 2a of 6 to 10 cm has proven to be quite advantageous. The singular needling points provided by the singularly disposed needles 2a cannot lead to an impairment of the surface appearance of the web 3, at least when these singular points are covered by the subsequent needling by means of the remaining needles 2, as this is the case with the arrangement of the protruding needles 2a in an inlet side portion 33 of the needle board 1.

As can be taken from Fig. 9, an extension of the conveying effect of the delivery rollers 7 to the needle area can efficiently be prevented when between the blow nozzle 9 of the additional web conveyor 8 and the delivery rollers 7 a guiding path 34 free from tensile stress is provided for the web 3. In the area of this guiding path 34 the web 3 is stored in the form of a stock loop 35, where with the aid of a means 36 monitoring the upper and lower limits for the stock length of the web 3, for instance light barriers, the drive 37 of the delivery rollers 7 is controlled by a control means 38 such that the stock length stored in the stock loop 35 always lies within the predetermined upper and lower limits. When this stock length reaches the upper limit, the monitoring means 36 will respond and, in connection with the control means 38 for the drive 37 of the delivery rollers 7, effect an increase of the withdrawal speed. When the monitoring means 36 responds in the area of the lower limit, the withdrawal speed of the delivery rollers 7 is reduced. The stock loops 35 indicated in dash-dotted lines are meant to illustrate these limits.

Due to the guiding path 34 for the web 3, which is provided free from tensile stress before the delivery rollers 7, the tensile stresses acting on the web 3 during the impingement of the needles remain restricted, because in the area of the

needles 2 only the forces exerted by the conveying air of the blow nozzle 9 on the web 3 can become effective in withdrawal direction. This provides for a needling of the web 3 largely free from tensile stress, which ensures a substantially troublefree needling operation. For correspondingly adjusting the forces acting on the web 3 in withdrawal direction via the stream of conveying air of the blow nozzle 9 corresponding to the respective requirements, the stream of conveying air can be controlled via the blow nozzle 11, for instance via control flaps or via a control of the blower. As can be taken from Fig. 9, the blow nozzle 9 is provided with an additional injector air hole 39, which ensures particularly favorable flow conditions.

C l a i m s :

1. A method of needling a web by means of needles repeatedly stitching into the web, where the web is withdrawn from the needling area at a continuous withdrawal speed by stretching the same during the impingement of the needles and by accelerating the same during its release by the needles, characterized in that after having been needled, but before being continuously withdrawn, the web is accelerated to a speed exceeding the withdrawal speed during the release by the needles.

2. The method as claimed in claim 1, characterized in that the web is accelerated to a speed exceeding the withdrawal speed by means of a continuous stream of conveying air having a flow component in withdrawal direction.

3. The method as claimed in claim 2, characterized in that the web conveyed out of the needle area merely by means of the stream of conveying air is guided free from tensile stress in a longitudinal portion thereof prior to its withdrawal.

4. The method as claimed in any of claims 1 to 3, characterized in that the web supplied at a predetermined supplying speed is deflected on the inlet side of the needles to different extents transverse to the web during the release by the needles, and is pulled until it is stretched on the outlet side of the needles.

5. A device for carrying out the method as claimed in any of claims 1 to 4, comprising at least one needle board reciprocatingly movable in stitching direction, comprising a stitch base opposite the needle board, and comprising continuously driven delivery rollers for the needled web disposed subsequent to the stitch base, characterized in that

between the stitch base (5) and the delivery rollers (7) a web conveyor (8) is provided whose conveying speed is larger than the withdrawal speed of the delivery rollers (7).

6. The device as claimed in claim 5, characterized in that before to the stitch base (5) a drivable pair of inlet rollers (13) is provided.

7. The device as claimed in claim 5 or 6, characterized in that the web conveyor (8) consists of at least one blow nozzle (9) inclined at an acute angle with respect to the web (3) for a flow component extending in withdrawal direction.

8. The device as claimed in claim 7, characterized in that on the web side opposite the blow nozzle (9) an air-permeable guiding surface (10) for the web (3) is provided.

9. The device as claimed in claim 8, characterized in that the guiding surface (10) is formed by the shell of a drum (10a) rotating in withdrawal direction.

10. The device as claimed in claim 5 or 6, characterized in that the web conveyor (8) consists of at least one pair of rollers (12) receiving the web (3) with a slip in its gap, which pair of rollers can be driven at a peripheral speed ex-ceeding the withdrawal speed of the delivery rollers (7).

11. The device as claimed in claim 10, characterized in that at least one of the rollers of the web conveyor (8) has flattened portions determining the slip during the impinge-ment of the needles.

12. The device as claimed in claim 5 or 6, characterized in that between the stitch base (5) and the delivery rollers (7) a web conveyor (8) is provided which periodically acts on

the web (3) in dependence on the lifting frequency of the needle board (1).

13. The device as claimed in claim 12, characterized in that the web conveyor (8) consists of a continuously rotating roller (20) parallel to the delivery rollers (7) with radial pick-ups (21) for deflecting the web transverse to the web surface.

14. The device as claimed in claim 13, characterized in that the pick-ups (21) have a different radial distance from the axis of rotation of the roller (20).

15. The device as claimed in claim 13 or 14, characterized in that the pick-ups (21) have a lining (23) increasing the frictional engagement with respect to the web (3).

16. The device as claimed in any of claims 5 to 15, characterized in that between the stitch base (5) and the pair of inlet rollers (13) an additional deflection means (24) is provided which periodically acts on the web (3) in dependence on the lifting frequency of the needle board (1).

17. The device as claimed in claim 16, characterized in that the deflection means (24) consists of a rotating roller (25) parallel to the pair of inlet rollers (13) provided with radial deflection lugs (26) for the web (3).

18. The device as claimed in claim 17, characterized in that the deflection lugs (26) have a different radial distance from the axis of rotation of the roller (25) of the deflection means (24).

19. The device as claimed in claim 6, characterized in that between the inlet rollers (13) and the stitch base (5) in the area of a free web guide (29) on the side of the web

(3) opposite the stitch base (5) at least one blow nozzle (28) is provided which is aligned transverse to the web (3).

20. The device as claimed in any of claims 5 to 19, characterized in that in the area of at least one portion extending transverse to the direction of web movement (31) the needle board (1) has individual needles (2a) protruding beyond the other needles (2) in stitching direction.

21. The device as claimed in claim 20, characterized in that the protruding needles (2a) have a thicker stem than the other needles (2).

22. The device as claimed in claim 20 or 21, characterized in that the protruding needles (2a) are provided in an inlet side portion (33) of the needle board (1).

23. The device as claimed in any of claims 7 to 9, characterized in that the conveying speed of the delivery rollers (7) can be controlled in dependence on a stock length of the web (3) stored between the blow nozzle (9) and the delivery rollers (7).

24. A method of needling a web substantially as herein described.

25. A device for needling a web substantially as herein described with reference to and as shown in the accompanying diagrammatic drawings.

The Patent Office

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Application No:	GB 9702069.7	**Examiner:**	E.L.Rendle
Claims searched:	1-25	**Date of search:**	5 March 1997

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): D1R (RGFC, RGFD, RGFF, RGFX, RGFZ)

Int Cl (Ed.6): D04H 18/00

Other: Online: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X, Y	GB 1 110 246	(FEHRER) see page 1 line 63 to page 2 line 79 and the figure.	X:1, 4. Y: 6, 10, 11, 20.
X, Y	GB 0 935 480	(BYWATER) see page 1 lines 22-38, page 2 lines 35-98 and figures 1-4.	X: 1, 5, 12, 13. Y: 6, 10, 11, 20.
Y	US 5 018 255	(VETROTEX) see column 2 lines 22-27 and figure noting alternating length needles.	20
A	US 3 894 320	(LAUMAN) see air nozzles 31, 32 and 33.	-

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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